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March 17, 2000

Federal Caucus Comment Record
c/o Bonneville Power Administration
707 W. Main Street, Suite 500
Spokane, Washington 99201
federalcaucus@bpa.gov

Re: Idaho Power Company comments to the draft "*All-H Paper*"

Dear Federal Caucus Members:

The undersigned, on behalf of the Idaho Power Company ("IPC" or "Company"), submits these comments to the draft "*All-H Paper*" produced by the Federal Caucus entitled: *Conservation of Columbia Basin Fish-Building a Conceptual Recovery Plan*. These comments must be put in context with the background of the Company's facilities, their physical location within the Snake River Basin, and the Company's current involvement with the dynamic set of processes unfolding in the region with respect to the fishery resources.

IPC is an investor owned utility formed in 1915. On October 1, 1998, IPC adopted a holding company structure with the formation of IDACORP, Inc. which serves as the parent company of IPC. IPC owns and operates 16 hydroelectric plants on the Snake River and its tributaries that are licensed by the Federal Energy Regulatory Commission (FERC). It also holds an interest in three coal-fired generating stations. IPC provides electric service to approximately 380,000 customers within a 20,000 square-mile service area covering portions of southern Idaho, eastern Oregon and northern Nevada.

The largest hydroelectric facility on the IPC system is the Hells Canyon Complex (HCC) consisting of the Brownlee, Oxbow and Hells Canyon dams. By opinion and order issued by the Federal Power Commission (now FERC) on August 4, 1955, IPC was granted a license to construct and operate three hydropower projects in the Hells Canyon reach of the Snake River. While separate applications were filed for each of the projects, the three were consolidated in the order issuing the license and have since been collectively referred to as the HCC, FERC Project No. 1971. The three facilities are located at RM 247-Hells Canyon Dam, RM 273-Oxbow Dam and RM 285-Brownlee Dam. The Brownlee facility, uppermost of the three, is the primary storage reservoir for IPC. The HCC is located on the Snake River upstream from Lewiston, Idaho and the four lower Snake River federal dams (Ice Harbor, Lower Monumental, Little

Goose, & Lower Granite) that are the subject of the "breaching" option in the *All-H Paper (Hydropower Option # 3, pg. 71)*.

The current FERC license for the HCC expires in 2005. IPC is presently engaged in a collaborative relicensing process with the intent of filing a final license application by July 2003. Numerous interests are represented in this collaborative process including state and federal resource agencies, Native American Indian Tribes and numerous smaller public and private interests. In preparation for the filing of a license application, IPC has initiated various aquatic studies relating to the HCC. These studies were developed in conjunction with the collaborative process with input from collaborative team members, including some of the agencies represented on the Federal Caucus. Attached to these comments is an *Executive Summary* and *Table of Contents* from a document entitled *Detailed Aquatic Study Plans* distributed by IPC in June of 1999 to interested participants in the relicensing process. These attachments briefly identify the nature and scope of the aquatic studies currently underway. An interactive workshop is scheduled for April 10-13, 2000 in Boise, Idaho to apprise interested relicensing participants of the progress of these studies. IPC anticipates that the majority of the studies will be completed by 2001 in order to allow for the preparation of a draft license application by late that year or early 2002.

IPC is also involved in a formal consultation process, under § 7(a)(2) of the Endangered Species Act (ESA), relating to current operations of the HCC. Formal consultation was initiated at the request of the National Marine Fisheries Service (NMFS) in reaction to a *Biological Assessment of the Hells Canyon Complex Operations* (BA) issued by FERC on February 19, 1999. In that BA, FERC determined that the interim operation of the HCC, in advance of issuance of a new license, is not likely to adversely affect listed Snake River salmon, or the critical habitat of salmon, and will not result in the destruction or adverse modification of the proposed critical habitat of steelhead. Upon review of the BA, NMFS, by letter dated March 24, 1999, expressed its non-concurrence with FERC's determination and initiated formal consultation. At the request of NMFS, the completion of the consultation process was extended beyond that contemplated by the applicable regulations (50 C.F.R. § 402.14). By letter dated September 17, 1999, NMFS advised that it expected to complete consultation by February 29, 2000.

By letter to FERC, with a copy to NMFS, dated February 8, 2000, IPC pointed out that the identification and assessment of the alleged impact of HCC operations on the listed species and habitat are, in part, influenced by a dynamic process involving other parties and events associated with (a) related administrative proceedings initiated pursuant to the Endangered Species Act with regard to the listed species, and (b) the ongoing HCC relicensing process. IPC requested that the consultation process be extended to allow for the consideration of any additional scientific or commercial data and information that might be developed through these processes. While IPC has had continuing discussions with FERC relative to these issues, NMFS has not responded to the request.

It is with that general background that IPC submits these brief comments to the *All-H Paper*. IPC agrees with the overall premise of the All-H process – the *conservation of Columbia Basin fish* – and that to accomplish that objective constructive dialogue must occur between the governments, industry and people of the region. (See: *Note to Readers – Purpose of the Conservation of Columbia River Fish Paper*) IPC remains committed to active participation in such a process. However, IPC believes that the *All H Paper*, both in its overall approach and with specific regard to its treatment of the HCC, commits three principal errors. First, the premise that flow augmentation from the upper Snake River is efficacious is wrong. Second, a party's responsibility for the loss of the fishery should correlate with its contribution to recovery efforts. Third, as to the HCC and Upper Snake, theory has been allowed to outstrip science.

The Alleged Efficacy of Flows

Each of the *hydropower options* considered by the *All-H Paper* contains a flow component from the HCC and the Upper Snake River. Two of the options (1 & 3) generally maintain the status quo under the 1995 Biological Opinion. The second option (*aggressive option*) calls for substantially more water from the HCC (an additional 200,000 acre-feet of reservoir space with a potential increase in flow augmentation at relicensing) and the Upper Snake (a potential increase of 1 million acre-feet). The assertion that flows from the Upper Snake River are efficacious is wrong - it is wrong both generally, in terms of the alleged correlation between flows from all of Idaho and fish survival, and specifically in its assertion that the HCC operations could substantially assist salmon survival in the lower Snake and Columbia rivers. IPC has reviewed the comments and supporting material submitted by the Idaho Water Users Association and Committee of Nine and supports their analysis demonstrating that the use of Upper Snake River water for flow augmentation will neither reverse the decline nor aid in the recovery of the listed species.

This is not to say that flows immediately below the HCC, and operations at the HCC, may not affect anadromous and native fish in the Hells Canyon reach of the Snake River. In 1991, IPC implemented the Fall Chinook Recovery Plan to address flow and operational issues that might affect fall chinook habitat below the HCC. IPC is also presently conducting a study in connection with relicensing (*Hells Canyon Instream Flow Assessment*) to explore issues relating to flows and operations at the HCC and the effects upon not only fall chinook but also white sturgeon and native salmonids (bull and redband trout) present in the Hells Canyon reach. This study, together with other studies and analysis, will be completed through the HCC relicensing process and will provide a scientific and reasoned basis upon which to assess the effects of the HCC on fishery resources.

Responsibility Counts

Those who have not adversely impacted the fisheries resources should not be made to bear a disproportionate amount of the pain for assisting in their recovery. However, the *All H Paper* proposes in large part to assign equal responsibilities for remediation to all members of the Snake River's community. This is inequitable, both for all of southern Idaho and for IPC. IPC has addressed past effects of the HCC on fishery resources through the 1980 Settlement Agreement and continues to address current or potential effects of the HCC through the Fall Chinook Plan and ongoing studies initiated in the connection with relicensing. It has also cooperated with the implementation of measures under the 1995 Biological Opinion which were intended to avoid jeopardy of the FCRPS. (IPC has been reimbursed for some, but not all, of the costs associated with these latter efforts because the measures implemented were to mitigate for impacts not attributable to the development and operation of the HCC. 16 U.S. C. § 839(h)(11)(A).)

Another example of the *All-H Paper* using a broad brush in assessing contribution without addressing responsibility relates to the Federal Caucus' goals for a regional fish recovery plan (pg. 2). The first goal is to conserve the species – *avoid extinction and foster long-term survival and recovery*. The third goal is to assure Tribal fishing rights – *restore salmon and steelhead over time to a level that provides a sustainable harvest*. The *Paper* does not specify the level of recovery necessary to achieve either of these goals, but it seems likely that the level necessary to sustain a tribal harvest is far greater than that necessary for conservation of the species. This raises serious questions as to whether non-federal interests can be compelled to contribute to recovery goals that may go beyond necessary conservation measures and address federal trust or treaty responsibilities to Native American Indian Tribes.

Theory Should Not Outstrip Science

While conceptual planning is important, the Federal Caucus has allowed theory to outstrip study efforts that were designed to formulate in a careful, cooperative manner a plan to address fisheries issues on the basis of the best scientific and commercial data. This ignores the dynamic, interactive character of the processes unfolding in the Basin, and is especially evident in the *All H Paper's* prejudgment of questions formally under study in IPC's relicensing effort. Prejudgment is neither good science nor prudent politics, both of which are essential in crafting an appropriate and acceptable approach to the difficult questions our region's fisheries present. IPC would urge the Federal Caucus to not allow the process of building a *conceptual recovery plan* to outstrip other federal, state or regional processes that are proceeding parallel to that effort and that may, if considered, aid in identifying viable recovery and conservation alternatives.

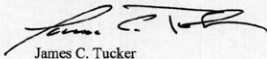
Notable in this regard is the tendency of the *All-H Paper* to refer to either the impact of the construction, or the benefits that might be derived from operation, of the HCC without any reference to data or studies that might support the reference. For instance, despite the admission that configuration options for FERC-licensed projects were not examined, on several occasions

the *All-H Paper* recites that habitat was lost by the construction of the HCC and presupposes that removal, or providing fish passage could restore that habitat (pp. 66, 68, 80; Hydro App. pg. 45). These statements are unsupported and disregard the potential that the quantity and quality of the habitat may have changed since the construction of the HCC. But they illustrate the scientific vacuum that exists and the tendency to fill that vacuum with theory. As illustrated by the attached *Executive Summary* from the *June 1999 Aquatic Study Plans*, IPC is currently conducting several studies in connection with ongoing relicensing efforts that may assist with this analysis. One of those studies (*Feasibility of Reintroduction of Anadromous Fish Above or Within the Hells Canyon Complex*) will offer a chronology of the decline of anadromous fish in the Snake River above the HCC, including an analysis of the factors that led to the destruction or loss of access to habitat within the historic distribution area. It will also assess the production potential for the area above the HCC prior to the development era (pre-1860) as well as immediately prior to the HCC construction. This study will be completed in 2001. It is inappropriate for the Federal Caucus to presuppose the outcome of that study by concluding that "removal of the Hells Canyon Complex could provide significant benefits to Snake River stocks" (pg. 68).

The *All-H Paper* makes similar references to the HCC with regard to other issues. Referring to potential for habitat restoration for fall chinook in the lower Snake River, the *All-H Paper* concludes: "opportunities to improve fall chinook habitat are limited, short of breaching lower Snake river or Hells Canyon dams..." (pg. 80). Again, IPC questions the accuracy of this statement without specific reference to a level of desired recovery and a corresponding need for additional habitat. Moreover, a relicensing study currently underway is designed to evaluate the extent and nature of the habitat below the HCC as well as to determine the effect of project operations on that habitat. (*Evaluation of Anadromous Fish Potential within the Mainstem Snake River Downstream of the Hells Canyon Complex of Reservoirs*, see attached *Executive Summary*.) Conclusions relating to opportunities for fall chinook habitat restoration or the benefits that might be derived from a reconfiguration of the HCC should be withheld until these and related studies are completed.

IPC appreciates having the opportunity to review and comment on the draft *All-H Paper* and looks forward to working with the Federal Caucus and other interests in the region to resolve these important resource issues.

Respectfully Submitted,



James C. Tucker

EXECUTIVE SUMMARY

TITLE: INTEGRATION OF AQUATIC STUDIES IN THE HELLS CANYON RELICENSING

Project Summary

The physical components that describe the Hells Canyon Complex are the basis for common evaluation and integration of natural resource studies. The aquatic resource studies will be integrated along these common physical boundary conditions described by reservoir levels and flows, water quality, and geomorphic processes. In addition to the common physical descriptions, integration is also required for further insight into mechanisms related to ecological interactions of the biological community.

Critical to the success of an integrated resource evaluation is the establishment of integrated databases. Efforts are currently underway to centralize the location and storage of IPC data on natural resources. Common data fields are shared among the different database structures to allow spatial linkage to IPC's Geographical Information System metadata.

TITLE: FEASIBILITY OF REINTRODUCTION OF ANADROMOUS FISH ABOVE OR WITHIN THE HELL'S CANYON COMPLEX

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Project Summary

A detailed chronology of the decline of anadromous fish in the Snake River Basin above and within the Hells Canyon Complex will be developed. The chronology will provide sources of historical accounts that allow descriptions of the distribution of anadromous fish, including known spawning areas. Primary factors that led to habitat destruction or complete loss of access to areas within the historic distribution will also be described. The production potential of the Snake River above Hells Canyon Dam prior to development (pre-1860) and the production potential and abundance immediately prior to the construction of the Hells Canyon Complex will be estimated. Present-day production for each basin will be estimated assuming passage at existing artificial barriers

were feasible. The existing state of the habitat within the historic distribution and factors potentially limiting anadromous fish if they were reintroduced into this habitat will be discussed. Categories of consideration include water quality and quantity, presence of barriers, quality of the physical habitat, and other biological factors such as the present-day fish community. Fish passage requirements and options necessary for reintroduction alternatives within the historical distribution will be described. An assessment to determine stocks that may be best suited for reintroduction will be made, as will an assessment of disease risk to the existing resident fish community if anadromous fish were reintroduced. The above information will allow development of reintroduction alternatives and provide the base information against which to evaluate the alternatives. From this feasibility assessment, the framework for a reintroduction plan can be developed, if regional interests or Idaho Power Company pursue this option.

TITLE: EVALUATION OF ANADROMOUS FISH POTENTIAL WITHIN THE MAINSTEM SNAKE RIVER DOWNSTREAM OF THE HELLS CANYON COMPLEX OF RESERVOIRS (RM 149-RM 247)

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Project Summary

The Hells Canyon Complex, comprised of Brownlee, Oxbow, and Hells Canyon dams and their resulting operations, could affect the availability of habitat for anadromous fish species. Specifically, operations may affect water quality, tributary access, availability of spawning habitat, the quality of the incubation environment, the quality and availability of rearing habitat, and the availability of food resources. Operations may also negatively affect the recruitment of spawning gravels into the river system. However, while substrate recruitment will not be addressed within the scope of this project, it will be addressed in a separate project.

We will conduct literature surveys to ascertain specific, current knowledge of habitat requirements (such as abiotic water quality) for migratory adult and juvenile anadromous fish. Water quality and hydraulic routing models, as well as empirical data, will be used to identify potential limiting periods and the magnitude of those limitations.

The free-flowing reach of the Snake River downstream of the Hells Canyon Complex is one of the most important habitat units available for spawning fall chinook salmon. Idaho Power Company (IPC) plans to continue monitoring the spawning activity of these fish downstream of the Hells Canyon Complex, in cooperation with the U.S. Fish and Wildlife Service, Nez Perce Tribe, U.S. Forest Service, and Washington Department of Fisheries. Habitat-use criteria listed in recent literature have been found unacceptable for modeling purposes within large river systems such as the Snake River. A detailed evaluation of the habitat use of fall chinook salmon will be developed during the course of this study for use in later modeling activities. The availability of habitat, in relation to discharges from the Hells Canyon Complex, will be modeled, and an estimate of spawner numbers

able to be supported within this river reach will be developed. This portion of the study will be completed in cooperation with U.S. Fish and Wildlife Service and Battelle Northwest Laboratories.

Recent studies within the Hanford reach of the Columbia River indicate that the hyporheic environment, crucial to the development of anadromous fish embryos, can be affected by large fluctuations of discharge from upstream hydroelectric projects. The hyporheic environment downstream of the Hells Canyon Complex will be studied to determine what the overall quality for incubating embryos is and whether operations affect the quality of that habitat.

The operations from the Hells Canyon Complex could also limit the availability of food resources and physical rearing habitat for juvenile fall chinook salmon. Results from the macroinvertebrate studies (the plans for which can be found in this compilation) will be coupled with findings from a comprehensive literature survey to determine whether food resources are limited within the free-flowing reach of the Snake River. Also, a model of rearing habitat availability will be developed in cooperation with the U.S. Geological Survey. The model will incorporate detailed substrate information of the canyon area with hydraulic routing and water quality models to determine how rearing habitat changes with discharges from the Hells Canyon Complex and whether that habitat is limited.

TITLE: EVALUATION OF IDAHO POWER HATCHERY PROGRAM

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Project Summary

In 1996 the Aquatic Resources Work Group (AWG) began the process of identifying issues to be addressed in the relicensing process for the Hells Canyon Complex. One of the issues identified was the future role of the Idaho Power (IPC) hatchery program as mitigation. The general perception of the AWG was that the current hatchery program was failing to meet its intent and also failing to meet the needs of the region for recovering anadromous fish listed under the Endangered Species Act (ESA). The AWG asked that IPC evaluate the current hatchery program and chart a new course for the future.

Starting with original goals and objectives developed in the early 1960s and continuing through current operation under ESA constraints, IPC has designed this study to summarize the history of the hatchery mitigation program. The hatchery program will be evaluated against requirements of the Federal Energy Regulatory Commission (FERC), and select performance measures will be compared with those of other hatcheries in the region. Despite suggestions from the AWG, modifying the hatchery program to meet new regional goals is not within IPC's jurisdiction. However, IPC will evaluate the suitability of its current facilities and broodstock for use in new and innovative

programs. IPC believes that information provided in this report will allow regional fisheries managers to decide how best to integrate IPC's hatchery facilities into future management programs.

TITLE: STATUS AND HABITAT USE OF WHITE STURGEON IN THE HELLS CANYON COMPLEX

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Project Summary

Members of the Aquatic Resources Work Group (AWG), with representatives from state, federal, tribal, and public entities, identified white sturgeon (*Acipenser transmontanus*) as one of several aquatic species influenced by the Hells Canyon Complex. Landlocked white sturgeon in the Snake River are considered a State of Idaho species of special concern and have limited access to historical habitat due to development in the Snake and Columbia rivers. Information on sturgeon in reaches associated with the Hells Canyon Complex was limited, which warranted investigation of their status and potential impacts from the complex. Issues of concern identified by the AWG range from effects of project operations on sturgeon to probability of long-term persistence. The study area for sampling sturgeon will encompass 270 miles of Snake River from Swan Falls Dam to the mouth of the Salmon River. Baited setline and gill net gear will be used to capture sturgeon. Data on population characteristics such as abundance, size distribution, age structure, relative condition, and reproductive potential will be recorded. Blood and/or fin tissue samples from sturgeon have been collected from Lower Salmon Falls to the Salmon River and sent to the University of Idaho for genetic analysis. A population viability model to address persistence of Snake River sturgeon will be developed with Oak Ridge National Laboratory. Habitat use by different life stages of sturgeon will be determined by recording water velocity, temperature, dissolved oxygen and substrate at each sample location. Information on physical habitat associated with spawning areas and effects of project operations on various sturgeon life stages will be described in detail in the Hells Canyon instream flow assessment study.

TITLE: STATUS, DISTRIBUTION, AND LIMITING FACTORS OF REDBAND TROUT AND BULL TROUT ASSOCIATED WITH THE HELLS CANYON COMPLEX

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Project Summary

The status of native salmonids will be described for the major tributaries and the reservoirs of the Hells Canyon Complex reservoirs. Emphasis in describing the status will be on density estimates, size structure, and genetic integrity along spatial gradients within the Hells Canyon Complex reservoirs and watersheds. In addition, information collected from both weir surveys and radio telemetry studies in the reservoirs and watersheds will be used to describe the evidence of various life histories and potential metapopulations remaining in the watersheds. Information about the spatial and temporal use of various life stages of native salmonids in the reservoirs will be used for describing the probable type of use and function the reservoirs serve and potential operational impacts that may be associated with that use. Tributary access relative to operations of the complex and the presence of barriers will be examined. Land-use characteristics, physical geomorphic features, macrohabitat features (riparian vegetation, water temperatures), the fish community structure, presence of exotic species, and hatchery introductions will be used to assess potential limiting factors to redband trout and bull trout within the reservoirs and priority watersheds. In addition, populations will be examined relative to the risk of extinction.

TITLE: HELLS CANYON COMPLEX RESIDENT FISH STUDY

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Project Summary

The Hells Canyon Complex Resident Fish Study will determine the status of the fish community and determine possible impacts of reservoir operations on the fish community structure. Electrofishing during April and September will allow us to sample the resident fish community. Species composition and relative density for each species will be calculated. Length and condition factors will be compared according to reservoir section. Relative year-class strength for smallmouth bass and crappie species will be estimated with a method described in EL-Zarka (1959). Age and growth will be determined for game fish through an examination of scales collected during fall

sampling. A stock recruitment model will evaluate entrainment to the crappie population in the Hells Canyon Complex.

We will use SCUBA techniques from April through July to observe and document spawning timing, site selection, and nesting requirements. Larval fish collections from April through August will help us determine growth rates, mortality rates, and density. Subsamples of larval fish will be aged and back-calculated to dates of hatch. Hatch densities will be compared to nesting densities.

An individual-based model will be developed with Oak Ridge National Laboratory (ORNL). The model will be used to predict potential reduction in year-class strength of centrarchid populations in reservoirs from the loss of nests due to water-level fluctuations and other mechanisms. Empirical data collected from Brownlee Reservoir will be used to calibrate this model. Operational scenarios will be converted to reservoir levels and run through the model to evaluate operational impacts.

TITLE: A SURVEY AND STUDY OF BENTHIC MACROINVERTEBRATES IN THE HELLS CANYON COMPLEX, INCLUDING ADJACENT UPRIVER AND DOWNRIVER REACHES

PRINCIPAL INVESTIGATOR: DIANNE CAZIER

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Project Summary

Assessment of benthic macroinvertebrates (community structure, function, and stability) in the Hells Canyon Complex and particular free-flowing segments is proposed as part of Idaho Power Company's relicensing efforts. An understanding of the benthic macroinvertebrate ecology will add to knowledge of the biological status of macroinvertebrates in the Hells Canyon Complex (HCC). The survey and assessment will begin in January 1998, and the report should be completed in July 2001. This survey and sequential data collection will be done according to standard aquatic invertebrate methods. In addition, the method of scuba diving will be used with dredges for deeper waters. During the first year (1998), we will collect baseline data to evaluate qualitative distribution and abundance of benthic macroinvertebrates within the system and their role as prey. The survey will start just below Swan Falls Dam and continue down to the confluence with the Salmon River. In the second year (1999), more empirical efforts will allow us to evaluate load following (flow fluctuations) and effects of reservoir fluctuations of the HCC on benthic macroinvertebrate communities. Assumptions are that benthic macroinvertebrate communities continue to occupy energy-processing roles in this system and that they are available for fish to eat. Another assumption is that the benthic community has evolved from the time of regulation and, in the meantime, adapted to hydropower operations. Results of this study will be essential for determining how the benthic macroinvertebrate community through the Snake River of the HCC is or can be related to protection, mitigation, and enhancement measures.

Issues were produced by the Aquatic Resources Work Group from comments made by participants on the Collaborative Team. It is from these issues that the study was originally designed. These issues provide the impetus for implementing, achieving, and completing the aquatic macroinvertebrate study.

TITLE: SEDIMENT TRANSPORT STUDY

PRINCIPAL INVESTIGATORS: JON BOWLING & SHAUN PARKINSON

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Project Summary

Sediment is an issue common to aquatic, terrestrial, and recreational resources. This sediment study for the Hells Canyon Complex (HCC) has been developed after consideration of issues and input from resource agencies, various experts in sediment transport and geomorphology, and the resource work groups.

The construction of a dam alters the flow patterns and disturbs the balance previously established by the river. This disturbance modifies the processes within the system, including sediment transport. The purpose of this study is to investigate changes in sediment supply and sediment transport and related effects in and below the HCC.

The HCC could be an effective sediment trap that limits the conveyance of sediment from the Snake River above Brownlee Dam to the Snake River below Hells Canyon Dam. In a 1990 study, Grams and Schmidt (1991) reported an estimated 75% decrease in the number and area of sand bars between Hells Canyon Dam and the Salmon River confluence since 1955.

A clear understanding of sediment processes is essential to our understanding of sediment-related impacts to aquatic habitat, such as fall chinook spawning gravel availability and persistence; terrestrial habitat, including riparian areas; and recreation areas, including beaches for camping.

Over the next two and a half years, this study will look at sediment-related processes to determine the current status and future condition of sediment within the HCC sediment study area.

The goal is to limit, as much as is practical, sediment-related impacts on sand bars, beaches, and aquatic habitat by the Hells Canyon Complex and its operations.

A final report will be prepared on the status of the impacts to the sediment supply, transport, and characteristics resulting from the HCC.

TITLE: HELLS CANYON INSTREAM FLOW ASSESSMENT

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Project Summary

An approach to an instream flow assessment using principles of the instream flow incremental methodology (IFIM) is described. The approach differs from the traditional PHABSIM in the use of two-dimensional (downstream and lateral; depth-averaged) hydrodynamic models within sections of river representing different channel morphology characteristics. Boundary conditions for the 2-D models will be a one-dimensional unsteady flow model, used for all resource studies, that routes the hydrograph from Hells Canyon Dam to each modeled area. The 1-D model will also incorporate water quality conditions based on temperature, dissolved oxygen, and total dissolved gas. Detailed bathymetric data will be collected to produce a digital elevation model for each site. A channel-classification scheme based on geomorphic features of the channel will be explored to assess the proportion of the Hells Canyon study reach with channel features similar to those of the modeled sections. Habitat-suitability criteria for white sturgeon, native salmonids, and fall chinook—based on depth, bottom velocity, mean column velocity, and substrate—will be applied to each modeled section to evaluate changes in habitats with discharge and flow scenarios from Hells Canyon Dam.

This approach allows for experiments with representative unsteady flows from project operations. In addition to the instream flow assessment, a behavioral experiment will evaluate movements and energetic expenditures of juvenile white sturgeon in response to a high, low, and unsteady flow simulated by the use of the 2-D model of the study area. The experiment will take place at the Pine Bar study section. Movements, habitat use, habitat availability, habitat preference, and energy expenditure will be compared among the flow trials. Energy expenditures will be measured with electromyogram (EMG) radio tags. The EMG tags will be calibrated in a laboratory by means of a respirometer to measure oxygen consumption. The flow experiment will also allow an assessment of load-following on benthic communities such as drift and stranding in near-shore and offshore locations (that is, whether and how drift and stranding are related to changes in flow and velocities at the Pine Bar site).

TITLE: OXBOW BYPASS MINIMUM FLOW EVALUATION

WATER QUALITY ASSESSMENT:

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INSTREAM FLOW ASSESSMENT:

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Project Summary

Construction of the Oxbow Power Plant resulted in water bypassing a 2.5-mile segment of the Snake River. A flow of 100 cfs is currently maintained except when the hydraulic capacity of the project is exceeded. During those times, water exceeding the hydraulic capacity is spilled through the bypassed reach. The Snake River upstream of the bypassed reach has been designated as water quality limited by the State of Idaho. Low flows in the bypassed reach are expected to further degrade water quality conditions. Water quality will be monitored throughout the reach under several flow levels and seasons. With definitions of water quality conditions under various flows throughout the year, defensible flows required for maintaining water quality in the bypassed reach can be identified.

In addition to water quality monitoring, an instream flow assessment will be conducted. This assessment will describe habitat and discharge relationships in the bypassed reach. Target species will include white sturgeon, fall chinook salmon, redband trout, and bull trout.

TITLE: POLLUTANT SOURCE STUDY

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Project Summary

This study was initiated by the Aquatic Resources Work Group in 1996 to evaluate the relative importance of pollutant sources to Brownlee Reservoir. Water quality in the Snake River and Hells Canyon Complex can be characterized as a result of pollutant loadings to the system and fate and transport, or processing, of those pollutants within the system. Both Idaho and Oregon recognize the Snake River immediately upstream of Brownlee Reservoir and Brownlee Reservoir itself as water quality limited. Of the 7140-cfs average annual flow that accrues in the Snake River from Swan Falls to Weiser, 82% of it can be attributed to the Boise, Payette, and Weiser rivers. The Snake River (upstream of Murphy), Boise River, and Payette River contributed 75% of the total phosphorus to the lower Snake River in 1995. These sources accounted for over 90% of the orthophosphate tributary loading in 1995. Additional data collection in the Boise and Payette rivers occurred in 1998. In 1999 sampling will occur in the Boise, Owyhee, Malheur, Payette, Weiser, Burnt, Powder, and Wildhorse rivers, and Pine and Eagle Creeks. The study is scheduled for completion in 2001.

TITLE: POLLUTANT TRANSPORT AND PROCESSING STUDY (1999)

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Project Summary

The pollutant transport and processing study was initiated in 1996 and is scheduled for completion in 2001. One goal of the study is to learn how pollutants are transported and processed through the three projects—Brownlee, Oxbow, and Hells Canyon—of the Hells Canyon Complex. Another goal is to develop a mechanism for evaluating impacts of project operations and the effectiveness of protection, mitigation, and enhancement measures in ensuring that beneficial uses of the complex are fully supported. The transport and processing of pollutants through the Hells Canyon Complex, especially through Brownlee Reservoir, has had visible and obvious effects on beneficial uses. Fish kills, algae blooms, and health warnings related to fish consumption have

occurred in past years. Many of the pathways related to pollutant transport and processing are complex and not easily defined or understood. Efforts in the first two years of this study identified specific pollutants of concern. Pollutants that are problems, or symptoms of problems, include nutrients, organic matter (algae), temperature, and low dissolved oxygen. Over the next three years efforts will be focused on improved understanding of pollutant fate and transport of problematic pollutants, evaluation of options for improving water quality, and written reports.

TITLE: TOTAL DISSOLVED GAS STUDY

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Project Summary

The total dissolved gas study was initiated in December 1996, with the development a study proposal by the Aquatic Resources Work Group. Elevated total dissolved gas (TDG) is known to have a detrimental effect on aquatic biota. The State of Idaho has established a standard of 110% of saturation for protecting aquatic biota. Water discharging from the spillways at the Hells Canyon Complex (HCC) dams often has elevated levels of TDG. The goal of the study was to assess the effects of project operations on TDG. The study will yield us the ability to predict the effects of operational and flow scenarios on TDG levels within and downstream of the HCC. Results will be essential for evaluations of the need for protection, mitigation, and enhancement measures to minimize elevated TDG levels, as well as for identification of potential operational measures to minimize supersaturation. The study is scheduled for completion in December 2001.

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